

Chronic obstructive pulmonary disease (COPD)

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Basic rules

- Make early diagnosis by spirometry and promote smoking cessation.
- A trial of steroids must be performed if starting long-term steroid treatment is considered.

Definitions

- Chronic bronchitis: sputum at least for 3 months in 2 consecutive years.
- Pulmonary emphysema: terminal air spaces widen and alveolar walls rupture.
- Chronic obstructive pulmonary disease (COPD): the patient has chronic, progressive airway obstruction, with no significant response to treatment. The patient may simultaneously have chronic bronchitis and emphysema.

Aetiology

- Most COPD patients (> 95%) are smokers. Half of those who smoke have symptoms of chronic bronchitis. In 15 - 20% of smokers a slowly aggravating airway obstruction is detected.

- Deficiency of alpha-1-antitrypsin is a rare cause of emphysema in young patients.

Symptoms

- Cough and sputum excretion are common symptoms of chronic bronchitis.
- All suffer from slowly increasing dyspnoea during exercise.
- The symptoms are aggravated by respiratory infection.

Signs

- Because of airway obstruction, wheezing rattles may be heard at the end of forced expiration.
- The patient with advanced emphysema has a barrel-chested appearance, in auscultation silent respiratory sounds are heard and in percussion the sound is hyperresonant.
- Cyanosis is associated with hypoxaemia.

Complications

- Acute
 - Repeated and prolonged lower respiratory infections
 - Acute respiratory failure
 - Pneumothorax (disruption of emphysematic bullae)
- Chronic
 - Cardiopulmonary disease (See related EBM Guideline: **Right ventricular failure** available on the EBM Web site)

Diagnosis

- Early diagnosis by spirometry in combination with active promotion of smoking cessation is essential.
- Test with a bronchodilating drug (See related EBM Guideline: **Pulmonary function tests** available on the EBM Web site)
 - The objective response to a bronchodilator (increase > 15%) is measured with spirometry and bronchodilator dose (e.g. inhaled salbutamol 200 µg twice daily), or PEF follow-up for two weeks.
- Evaluate the effectiveness of anti-inflammatory treatment with a trial of steroids.
 - Oral prednisolone, initially 30 - 40 mg/day (if necessary, some protection against ulcers, e.g. a PPI), or inhaled steroid (e.g. budesonide 800 µg twice daily). In oral administration the trial duration is 2 weeks, with an inhaled steroid 6 weeks.
 - If there is an objective response PEF or FEV₁ increase > 15% and at least 200 mL), continue with inhalation steroid (the patient may also have asthma).
- Diffusion capacity
 - Decreased in COPD, normal in asthma.
- Blood gas analysis
 - In late stages of COPD arterial blood pO₂ decreases and pCO₂ may increase
- Chest radiograph is of limited value in COPD diagnosis.

Treatment

Cessation of smoking

- The most essential factor regarding the prognosis.
- Does not normalize lung function, but the progressive deterioration of FEV₁ slows down and proceeds at the same pace as in nonsmokers.
- According to present knowledge, there is no drug therapy available that could delay the deterioration of lung function if the patient continues smoking. Drugs act only by relieving subjective symptoms and in the treatment of acute exacerbations.

Basic rules in drug therapy

- Mild disease (FEV₁ < 80% of reference value)
 - Asymptomatic patients
 - No drug therapy
 - Symptomatic patients
 - Anticholinergics or short-acting beta-2-agonists according to clinical response
 - Trial of steroids if asthma is suspected
- Moderate disease (FEV₁ < 65%)
 - Anticholinergics or short-acting beta-2-agonists (possibly combined) according to clinical response.
 - Trial of steroids if asthma is suspected
- Severe disease (FEV < 45%)
 - Combination of anticholinergics and beta-2-agonists on a regular basis
 - Trial of steroids
 - Trial of long-acting beta-2-agonists
 - Trial of theophylline

Bronchodilating medication

- Inhaled anticholinergic drug (ipratropium or oxytropium bromide) (Level of Evidence = C; Evidence Summary available on the EBM Web site)
 - First line treatment
 - The dose must be high enough; administration 4 - 6 times daily.
- Inhaled beta-sympathomimetic (salbutamol, terbutaline, fenoterol) (Level of Evidence = A; Evidence Summary available on the EBM Web site)
 - May be combined with an anticholinergic drug
 - Long-acting beta-sympathomimetics may improve quality of life and reduce symptoms (Level of Evidence = C; Evidence Summary available on the EBM Web site).
- Oral, long-acting theophylline
 - adverse effects (central nervous system, gastrointestinal symptoms) are common (follow-up of serum concentrations is necessary!)
 - Arrhythmias and convulsions are signs of toxicity.
 - Keep in mind various interactions with other drugs (e.g. antibiotics)!

Anti-inflammatory medication

- Inhaled steroids are only prescribed for patients who objectively benefit from a trial of steroids. The benefit in terms of lung function is very limited (Level of Evidence = B; Evidence Summary available on the EBM Web site).

Treatment of mucous excretion

- If production of mucus is a problem, the patient may empty the lungs (Level of Evidence = C; Evidence Summary available on the EBM Web site) at home
 - by using expiration resistance (PEP mouthpiece) or blowing air through a straw into a bottle filled with water, combined with effective coughing
- Mucolytic agents should be used only temporarily (Level of Evidence = B; Evidence Summary available on the EBM Web site).

Treatment of acute exacerbation

- Oxygen by nasal catheter or by venturi mask . Caution should be exercised when dosing (if the result of an arterial blood gas analysis is not available, the concentration of mask oxygen should not exceed 28%, or nasal catheter flow should not exceed more than 2L/min in patients above 50 years of age).
- An inhaled sympathomimetic (salbutamol 2.5 - 5 mg or terbutaline 5 - 10 mg) by a dosing device or a spray. It can be combined with an inhaled ipratropium bromide 0.5 mg).
- There is no evidence of a significant effect of theophylline infusion (Level of Evidence=C; Evidence Summary available on the EBM Web site) but it can be used at a dose of 0.5 mg/kg/h if response to other treatments is poor. Serum theophylline concentration should be monitored if possible.
- Methyl prednisolone 0.5 mg/kg every 6 hours is probably beneficial. Also oral corticosteroids (prednisolone 30 - 40 mg/day) are used empirically for 7 - 14 days.

Acute infection

- Antimicrobial treatment in exacerbation of COPD is controversial¹ (Level of Evidence = B; Evidence Summary available on the EBM Web site). Factors that indicate starting antimicrobial treatment include
 - increased dyspnoea
 - increased sputum
 - purulent sputum.
- If the patient exhibits two of the three symptoms listed above, an antimicrobial drug is usually indicated (Level of Evidence = B; Evidence Summary available on the EBM Web site).
- Alternatives in antimicrobial treatment:
 - Amoxicillin 500 mg three times daily for 10 days
 - Doxycycline 150 mg once daily for 10 days
 - Sulpha-trimethoprim, dose of trimethoprim 160 mg twice daily for 10 days.
- Antibiotics do not belong to the basic maintenance therapy of COPD.

Improvement of exercise capacity

- Long-lasting, regular, and moderate exercise (Level of Evidence = A; Evidence Summary

Vaccinations

- Influenza vaccination to all patients with clearly decreased ventilatory function (Level of Evidence = C; Evidence Summary available on the EBM Web site).
- Pneumococcal vaccination is recommended.
- Haemophilus influenzae vaccination may also be beneficial (Level of Evidence = B; Evidence Summary available on the EBM Web site).

Oxygen therapy at home

Basics

- Oxygen therapy at home can be used to prevent elevation of pulmonary arterial pressure in advanced COPD and to extend the survival of the patient.
- The effect of oxygen therapy on symptoms (e.g. shortness of breath) is quite limited.
- Oxygen therapy at home is meant only for patients with chronic hypoxaemia, i.e. arterial desaturation.
- Treatment decisions should be made after critical consideration.
- When initiating oxygen therapy at home, appropriate monitoring of treatment must be ensured. Treatment decisions and implementation of treatment are best left to a local pulmonary clinic to be taken care of.

Initiation criteria for oxygen therapy

- Chronic, advanced pulmonary disease ($FEV_1 < 1.5$ L)
- The partial pressure of oxygen in arterial blood, with the patient in stable stage breathing room air, in two samples taken with an interval of at least three weeks < 7.3 kPa.
- Partial pressure of oxygen can also be 7.3 - 8.0 kPa if one of the following criteria is involved:
 - signs of increased pulmonary arterial pressure (e.g. oedema)
 - secondary polycythaemia (crit > 55)
 - significant nocturnal hypoxaemia established by oximetry and reversible by oxygen therapy and not caused by concomitant sleep apnoea syndrome
 - significant neuropsychological symptoms reversible by oxygen therapy.
- Oxygen therapy enables a desired response ($PaO_2 > 8.0$ kPa) without unfavourable increase in partial pressure of carbon dioxide in arterial blood.
- The patient does not smoke and is co-operative enough.

Implementation of treatment

- Oxygen therapy at home is currently usually implemented using an electric oxygen concentrator. The oxygen concentrator eliminates nitrogen from room air and provides the patient with over 90%-proof oxygen. Compressed tanks can still be used in places with no electricity.
- Portable liquid oxygen is suitable for a small group of patients. Primarily these are patients who are still working or who for some other reason have special needs for mobility.

- All oxygen therapy necessitates good co-operation by the patient and willingness for long-term co-operation with the treating unit.
- Home calls made by a rehabilitation instructor are an essential part of the monitoring of patients receiving oxygen therapy at home.

Related evidence

- **There is little evidence on the effectiveness of ambulatory domiciliary oxygen therapy on exercise capacity in patients with COPD** (Level of Evidence = C; Evidence Summary available on the EBM Web site).
- Noninvasive ventilation reduces mortality and need for intubation in severe exacerbations of COPD (Level of Evidence = A; Evidence Summary available on the EBM Web site).
- In patients with stable COPD, pMDI produce similar outcomes to dry powder devices for delivering beta-2 agonist (Level of Evidence = C; Evidence Summary available on the EBM Web site).
- Nutritional support has no significant effect on anthropometric measures, lung function or exercise capacity in patients with stable COPD (Level of Evidence = B; Evidence Summary available on the EBM Web site).
- Cardiosensitive beta-blockers do not produce significant short-term reduction in airway function when given to patients with COPD (Level of Evidence = B; Evidence Summary available on the EBM Web site).
- There is no clear evidence supporting vibration for clearing bronchial secretions (Level of Evidence = D; Evidence Summary available on the EBM Web site).
- Stapling is more effective than laser resection for lung volume reduction in diffuse emphysema, but there is no evidence from randomised trials comparing surgery with optimal conservative treatment (Level of Evidence = B; Evidence Summary available on the EBM Web site).

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